United States National Data Center

System Requirements Document

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Aeronautical Systems Center
Patrick AFB, FL 32925

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1.0 Introduction

1.1 Scope

This System Requirements Document (SRD) defines performance requirements for the Phase 2 United States National Data Center (US NDC) which will augment, not replace, functionality provided with the Phase 1 system. The Phase 2 US NDC is the processing and archiving component of the Nuclear Explosion Monitoring Program (NEMP) which consists of six data collection subsystems and associated sensors located around the world: seismic, infrasonic, hydroacoustic, radionuclide, satellite, and the US NDC at the Air Force Technical Applications Center (AFTAC). The US NDC subsystem integrates, processes, and analyzes data from the other five subsystems in order to detect and report nuclear events. It also collects and forwards to the International Data Center (IDC) unclassified, unprocessed data (with the exception of satellite data) from these subsystems as required by the Comprehensive Test Ban Treaty (CTBT) and provides unclassified, unprocessed data to US researchers on demand. This SRD focuses upon the US NDC portion of the NEMP, the performance requirements necessary to meet US national monitoring objectives, and a training system to provide skilled personnel to operate the US NDC.

1.2 Program Background

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1.2.2 US NDC Role in the International Monitoring System

The International Monitoring System (IMS) consists of three major components; an International Data Center (IDC), National Data Centers (NDCs) in participating member states, and seismic stations in each member state. Data sent to the IDC will be collected, archived, processed, and provided to all CTBT signatories on a routine basis. AF b(2)
The IDC will also provide services to each CTBT signatory so they can fulfill national AF b(3)
verification functions. The IDC will be the repository for other data and information provided by CTBT signatories or generated within the CTBT Organization (CTBTO). This repository will assist in ensuring compliance (i.e., data on non-nuclear explosions, software documentation, or information on the status of equipment). The IDC will also serve as the communications hub for the international monitoring network.

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1.2.3 Authority

The US Department of Defense (DoD) has designated the Aeronautical Systems Center (ASC) as the acquisition authority and AFTAC as the organization to operate and manage the contribution of US seismic data to the IDC for the IMS.

1.3 Mission

AFTAC's mission is to monitor compliance with nuclear test ban treaties to standards set by US verification and policy leaders. This mission requires AFTAC to detect, locate, classify, evaluate, store, and report all suspected nuclear explosions. AFTAC uses several different monitoring techniques to perform this mission, each designed to monitor a specific physical domain (e.g., space, atmosphere, underground, underwater, etc.) for nuclear explosions. The US NDC will acquire, process, and store data from sensors spanning all applicable techniques.

1.4 Objectives

AFTAC's objectives are as follows:

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1.4.1 Three-phased approach

The US NDC is being developed in three phases. Phase 1 was developed under a series of AFTAC-managed delivery order contracts with Science Applications International Corporation (SAIC). Phase 2 development will be managed by ASC/RAU (Detachment 3 ASC) through a sole source contract with SAIC. Requirements and an acquisition strategy for Phase 3 development have yet to be determined. This SRD contains requirements for Phase 2.

2.0 Applicable Documents

US NDC and US NDC Training System requirements have been derived from the following documents, of the exact issue shown. They should not be construed as defining additional requirements or indicating any preconceived solution. In the event of conflict between a referenced document and this SRD, the requirements herein shall take precedence. The list below is not intended to be a complete list of all existing documents relevant to the US NDC, the US NDC Training System, or the Alternate US NDC.

2.1 Government Documents

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- [redacted]
- AFM 33-229, Controlled Access Protection (CAP), 1 November 1997
- Air Force Manual 33-270, Command, Control, Communications, and Computer (C4) Systems Security Guide, 8 August 1994
- Air Force Technical Applications Center Operational Requirements Document for the US National Data Center, 13 December 1997
- System Requirements Document for the United States National Data Center (Phase 2), 15 August 1999 Revision D (rescinded)
- Phase 1 System Requirements Document for the US National Data Center, 16 February 2000, Version 1.9
- US NDC Training System Requirements Document, Version 15
- Concept of Operations for the US National Data Center, 3 December 1997
- System Requirements Document for the Seismic Data Acquisition System (SDAS), 13 Apr 2001
- Hydroacoustic Data Acquisition System (HDAS) Performance Specification, N00039-HDAS-100, Revision 5, 20 February 1998
- System Requirements Document for the Infrasound System (draft), Version 2.0, 9 April 1999
- System Requirements Document for the Radionuclide Aerosol Sampler/Analyzer (RASA), 6 December 1996
- Network Definition Document for the United States National Data Center (Phase 2), Apr 2001
- Air Force Manual 33-223, Identification and Authentication, 1 June 1998
- Air Force Technical Applications Center Proposed Capabilities for the Alternate US National Data Center, 17 May 2000

2.2 Non-Government Documents

- UN General Assembly A/50/1027, Annex 1 to the Protocol, 26 August 1996
- Operational Manual for Hydroacoustic Monitoring and the International Exchange of Hydroacoustic Data (draft), CTBT/WGB/TL-11/3/Rev. 4, dated 11 May 1999
- Operational Manual for Infrasound Monitoring and the International Exchange of Infrasound Data (draft), CTBT/WGB/TL-11/4/Rev. 4, dated 11 May 1999
- Operational Manual for Seismological Monitoring and the International

Exchange of Seismological Data (draft), CTBT/WGB/TL-11/2/Rev. 4, dated 11 May 1999

- Operational Manual for Radionuclide Monitoring and the International Exchange of Radionuclide Data (draft), CTBT/WGB/TL-11/5/Rev. 4, dated 11 May 1999
- Updated Draft of the Operational Manual for the International Data Centre (September 1998 Update), CTBT/WGB/TL-2/14, dated 3 September 1998
- Revisions to the Operational Manual for the International Data Centre, Sections 3.1, 3.2, and 4.1; CTBT/WGB/TL-2/19, dated 8 February 1999

3.0 US NDC System Requirements

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3.1 General Requirements

N3.1.a The Phase 2 US NDC shall continue to meet all capabilities from the Phase 1 US NDC system.

N3.1.b The US NDC shall consist of a distributed processing system made up of COTS-based equipment and connected through a local area network (LAN).

N3.1.c The US NDC shall be partitioned into discrete subsystems: an Operational subsystem, a Development subsystem, a Sustainment subsystem LAN (which allows development and testing to continue simultaneously with system operation), a Training subsystem, and an alternate operational subsystem.

N3.1.d The US NDC shall provide the capability to undergo a full development and operational test and evaluation on the Development/Sustainment subsystems with no impact to ongoing operations.

N3.1.e The US NDC Sustainment subsystem shall be fully functionally redundant with the Operational subsystem, with no shared components between subsystems except for data feeds and archives.

3.2 System Automation

N3.2.a The US NDC shall automatically execute data acquisition, data processing, and data storage functions.

N3.2.b The US NDC shall provide manual execution capability for all automated data acquisition, data processing, and data storage functions.

3.3 Data Formats

N3.3.a The US NDC shall use standard data input formats for waveform data.

N3.3.b The US NDC shall have forward and backward compatibility with the standard waveform data.

3.4 Data Authentication

N3.4.a The US NDC shall provide the capability to acquire authenticated data.

3.5 External Interface Requirements

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3.6 Data Acquisition

N3.6.a The US NDC shall automatically acquire unprocessed seismic, hydroacoustic, infrasonic, and radionuclide sensor data.

3.6.1 Data Transfer Integrity

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N3.6.2 Command and control

N3.6.2.1 The US NDC shall integrate the capability, to be provided as GFE, to transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC.

3.7 Data Processing Requirements

N3.7.a The US NDC shall automatically store all data processing results and associated data as soon as they are available.

N3.7.b The US NDC shall provide access to all data processing results, which have been committed to data, storage.

N3.7.c The US NDC shall automatically process all data from stations listed in the US NDC NDDOC.

3.8 Interactive Analysis

N3.8.a The US NDC shall provide an interactive analysis capability to review, refine, correct, and/or display current results, regardless of whether they have been generated directly from the automated processing system or have been previously analyzed.

3.9 Report Requirements

N3.9.a The US NDC shall provide the capability to automatically generate reports for all events.

3.10 Data Storage Requirements

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3.11 Data Processing Performance Monitoring

N3.11.a The US NDC shall provide the capability to automatically and interactively monitor data processing functions.

N3.11.b The US NDC shall provide the capability to automatically and manually generate performance monitoring reports.

3.12 Geographical Information System

N3.12.a The US NDC shall integrate the capability, to be provided as GFE, to use geographically referenced information required for data processing [redacted] AF b(2) AF b(3)

N3.12.b The US NDC shall integrate software tools and functions, to be provided as GFE, which automatically and interactively access, spatially manipulate, and spatially process geographically referenced data.

3.13 Tuning and System Evolution

N3.13.a The US NDC shall provide software tools to support tuning and evolution of geophysical performance.

4.0 Supportability Requirements

4.1 Service Life

N4.1.a The expected service life of all US NDC operational platform hardware components shall be five years from the conclusion of Phase 2 System Acceptance Testing.

4.2 Mission Duration

N4.2.a The US NDC shall support a mission duration of 24 hours per day, 7 days per week, 365 days per year.

4.3 Availability

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- Mean Restoration Time (MRT) - the time to restore the subsystem to an operational condition after a critical failure and includes notification, response, supply, administration, and maintenance.

- Mean Time Between Critical Failures (MTBCF) - the time between critical failures. A critical failure implies that a portion of the US NDC hardware and/or software is unable to collect or process required data. Any of the following conditions constitutes a US NDC critical system failure:

  - The inability of the US NDC to continuously process data from any sensor station identified as essential to monitoring within one hour of data acquisition at the station.

  - The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 98% data accuracy and within 15 minutes of data acquisition at the station.

  - The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 97% data timeliness and within five minutes of data acquisition at the station.

  - The inability of the US NDC spotlight and forward processing pipelines to identify and report an explosion within one hour of data acquisition at the station.

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4.4 Maintainability

N4.4.a The US NDC shall be designed for a two-level maintenance concept.

N4.4.b The US NDC shall exhibit a minimum time between preventative maintenance routines (PMRs) of 720 hours.

N4.4.c No US NDC PMR shall require a system outage such that a critical failure situation (as defined in requirement *N4.3.a*) occurs.

4.5 Fault Detection and Isolation

N4.5.a All US NDC critical failures (as defined in paragraph *N4.3.a*) shall be automatically detected and reported.

N4.5.b All detected faults shall be isolated to one LRU using a combination of automatic fault isolation and manual troubleshooting procedures contained in the system technical documentation.

N4.5.c The US NDC shall detect and report the loss of a storage device.

N4.5.d The US NDC shall automatically switch to an alternate storage device to allow for continued system operations in the event of a storage device failure.

N4.5.e The US NDC shall provide a graphical display of US NDC system status by monitoring and reporting the health of US NDC critical hardware and software components in a real-time environment.

N4.5.f The US NDC shall allow for data recovery in the event of storage device failure.

4.6 LRU Removal and Replacement

N4.6.a The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour without loss of data or system integrity.

4.7 Automatic Maintenance Data Collection

N4.7.a The US NDC shall provide the capability to automatically monitor, collect, and report fault information.

4.8 Interchangeability

N4.8.a The US NDC shall maximize the use of interchangeable workstations, LRUs, and circuit card assemblies (CCAs).

4.9 Safety

N4.9.a The US NDC shall operate at a noise level in accordance with the Occupational Safety and Health Administration (OSHA) guidelines for an office environment.

5.0 Security Requirements

5.1 Security Procedures

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5.2 Security Architecture

N5.2.a The US NDC architecture shall comply with all security standards levied down by appropriate DAA.

6.0 System Requirements

6.1 Operating Environment Requirements

N6.1.a The US NDC system shall be capable of operating in a normal office environment with local power, 110-120/220-240 volts AC, 60 Hz, single phase, and shall be robust enough to handle voltage irregularities and power loss without damaging the system and/or losing stored data.

N6.1.b The US NDC shall be capable of sustained operation over the temperature range of 60-90° F.

N6.1.c The US NDC shall be capable of sustained operation over the relative humidity range of 20-80%.

6.1.1 Shutdown and Re-start

N6.1.1.a The US NDC shall have the capability to perform an orderly shutdown when notified of an imminent power loss and/or if the ambient temperature exceeds 90° F.

6.2 Electromagnetic and Electrostatic Discharge Requirements

N6.2.a The computer hardware elements of the US NDC system shall meet commercial standards and shall not fail due to electrostatic discharges produced by proper handling, operation, and maintenance of the system.

6.3 Federal Communications Commission Class A Standards

N6.3.a The US NDC computer hardware shall comply with Part 15 of Federal Communications Commission (FCC) rules for Class A digital devices.

6.4 Toxic Products and Hazardous Materials

N6.4.a The US NDC shall comply with the requirements of applicable regulations promulgated by federal regulatory agencies governing toxic products and hazardous materials.

6.5 Volatile Organic Compounds

N6.5.a The US NDC shall not include, or require the use of, volatile organic compounds restricted by regional air quality regulations.

6.6 Growth Capability

N6.6.a The US NDC shall be designed to support introduction of upgraded software/hardware, functionality, and additional processing capacity without unplanned loss of previous capabilities.

7.0 Computer Software Requirements

N7.0.a The US NDC software shall be written in high order programming languages, minimizing the number of languages.

N7.0.b The US NDC shall make maximum use of commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) software.

8.0 User Interface Requirements

N8.0.a The US NDC software shall have a uniform and consistent user interface for access to all the processing capability within the US NDC.

9.0 US NDC Training Subsystem

N9.0.a The US NDC Training Subsystem shall reliably simulate US NDC operations, and support the school's effort to provide personnel capable of performing to AFTAC standards in this critical environment.

10.0 Alternate US NDC

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N10.0.b The Alt US NDC shall ensure continuous 24-hour operations during times of evacuation of AFTAC during natural disasters.

Appendix A: Definitions

312th Training Squadron – the unit at Goodfellow AFB that will receive and operate the US NDC Training System.

ADSN – AFTAC Distributed Subsurface Network

AFTAC – Air Force Technical Applications Center

Alphanumeric Data – all ASCII data, including parametric data, requests, and calibrations.

Ancillary Data – Any data in the data stream that is not waveform data. For example, SOH information (calibration status, digitizer information, tamper indicators, voltage levels, etc.); environmental data (outside temperature, wind speed, barometric pressure, etc.); data quality information (signal to noise ratio, data gaps, etc.).

Application Programming Interface (API) – a boundary across which application software uses facilities of programming languages to invoke services. These facilities may include procedures or operations, shared data objects, and resolution of identifiers. An API specification documents a service and/or service access method that is available at an interface between the application and an application platform.

Archive – the process of saving existing database results out to permanent storage at regular intervals, thereby preserving the data processing results throughout time and providing a historical record of data processing results.

ASC – Aeronautical Systems Center

Associate – the process of determining that signals from multiple sensors are related to the same event. Data such as signals, detections, and/or waveforms are said to be "associated to" the event, location, or origin.

Audit Trail – chronological record of system activities to enable the reconstruction and examination of the sequence of events and/or changes in an event

Authentication – a security measure designed to protect a communications system against acceptance of a fraudulent transmission or simulation by establishing the validity of a transmission, message, or originator.

Availability of Data – data that is in the place, at the time, and in the form needed by the user

BARPM – Broad Area Regional Processing Mode

BPM – Back Processing Mode

Beam forming – the process of shifting and adding the recorded waveforms. This process cancels out noise and aligns major signals to remove propagation delays in the seismic array.

Channel – refers to output from an individual sensor

Class A Digital Device – As defined by the Federal Communications Commission, a Class A digital device is a device that is marketed for use in a commercial, industrial, or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Corroborate – the process of analyzing signal characteristics from one or more techniques for evidence, which would strengthen or confirm an initial event hypothesis.

COTS – Commercial Off-The-Shelf – refers to commercially available hardware and software that has not been locally modified

Critical failure – when a portion of the system is unable to collect or process the required data

CTBT – Comprehensive Test Ban Treaty

DAS – Data Acquisition System

Data Integrity – condition that exist when data is unchanged from its source and has not been accidentally or maliciously modified, altered, or destroyed

DLP – Data Link Processor – hardware/software that handles real-time data collection in ADSN field subsystem.

FK analysis – spectral analysis in the frequency and wave number domain

FPM – Forward Processing Mode

GIS – Geographical Information System

GOTS – government off-the-shelf

GPM – Global Processing Mode

GSE – Group of Scientific Experts of the UN Conference on Disarmament

GUI – Graphical User Interface

IDC – International Data Center

Identification – process that enables recognition of an entity by an automated information system. NOTE: This is generally accomplished by using unique machine-readable user names.

IMS – International Monitoring System

LAN – Local Area Network – a hardware/software system for linking computers, storage devices, and graphics devices over a relatively small geographic area (e.g., a building)

Late-arriving data – data that arrive after initial automatic processing of the time interval was begun or up to six months behind real-time

LRU – Line Replaceable Unit

Metadata – the "data about the data." The data that provides the history behind the collection of data, (i.e., reliability, accuracy, dates of collection, the source/origin, etc.)

MRT – Mean Restoration Time – the average time it takes to restore the system to an operational condition after a critical failure, including time for notification, response, supply, administration, and maintenance

MTBCF – Mean Time Between Critical Failures

MTBF – Mean Time Between Failures

NEMP – Nuclear Explosion Monitoring Program

OSHA – Occupational Safety and Health Administration

Parametric data – information on detection picks such as time, amplitude, period, etc.

PMDOC – Priority Matrix Document

PMR – Preventative Maintenance Routines

Processing Modes - refers to the Global, Broad Area Regional, Spotlight, Forward, and Back Processing Modes of the US NDC headquarters system.

Regional Phase – seismic phase observed at a station which is six to 16 degrees from an event.

SEED – Standard for the Exchange of Earthquake Data. Data transfer format for ASN stations.

Sensor(s) – the equipment needed to produce seismic signals, convert them to digital format, and return the signals to the data processing and/or transmission equipment. Typically, "sensor" includes the seismometer, remote terminals, and the intrasite communications.

Short period data – falls in the 0.5 – 10 Hz range

SMU – Southern Methodist University

SOH – State of Health – SOH data includes, but is not limited to, data status, equipment security status, timing system status, and miscellaneous station status indicators. SOH data does not include meteorological data.

SPM – Spotlight Processing Mode

State – a stage (level, degree or period of time in the course of a process or activity) or condition of structure, growth, or development. Defines a static condition.

Station – a relatively small geographical area/facility at which a number of seismic sensors (possibly including an array) may be located.

Status – a stage (level, degree or period of time in the course of a process or activity) of progress. Defines a dynamic situation.

Teleseismic Phase – seismic phase observed at a station which is greater than 16 degrees from an event

TT – the AFTAC Nuclear Treaty Monitoring Directorate

Unprocessed data – continuous waveform data as it comes out of the remote terminal.

USGS – United States Geological Survey

US NDC – United States National Data Center

Appendix B: Requirements Verification

B.1 Introduction

This appendix includes a Requirements Verification Matrix and a listing of specific instructions for verification of key requirements. The matrix contains a row for each requirement in the Phase 2 SRD, a textual description of the requirement, and the verification method(s) the Contractor shall use to verify each requirement.

The requirement verification methods are Inspection, Analysis, Demonstration, and Test. For some requirements, multiple verification methods may be employed. The following describes each verification method:

B2.0 Requirements Verification Matrix

B2.1 Inspection (I)

The Contractor shall verify requirements by **Inspection** by physically examining hardware, source code, parameter files, and/or other physical manifestations of hardware and software, such as software-generated printouts and diagrams. Inspection implies observation/examination to verify requirements, usually without the need for analysis, demonstration, or test. Inspection does not involve software execution.

B2.2 Analysis (A)

The Contractor shall verify requirements by **Analysis** by examining and analyzing the internal structure of hardware and software. This will most likely be required when a requirement cannot be directly tested and observed. Analysis may require a review or study of data, mathematical expressions, or software models. Twenty-two analysis requirements are annotated with an asterisk (*), which indicates they cannot be verified by the time System Acceptance Testing is completed. The Government will take sufficient measurements and compile appropriate data for one year after completion of System Acceptance Testing to determine if these requirements have been met.

B2.3 Demonstration (D)

The Contractor shall verify requirements by **Demonstration** by observing the performance of software or hardware, where specific inputs have an expected result, and when the software is executed on the hardware according to the test procedure.

B2.4 Test (T)

The Contractor shall verify requirements by Test by exercising software or hardware with pre-determined inputs and then recording and analyzing the measurable response. Test involves measurements or quantitative observations of the performance of a function or equipment. The requirement is verified by comparing test results with quantitative criteria such as predicted values, a range of values, accuracies, or tolerances.

Requirements Verification Matrix		Verification Method			
SRD Para. No.	Requirement Text	I	A	T	D
N3.1.a	The Phase 2 US NDC shall continue to meet all capabilities from the Phase 1 US NDC system.	I	A	T	D
N3.1.b	The US NDC shall consist of a distributed processing system made up of COTS-based equipment and connected through a local area network (LAN).	I			
N3.1.c	The US NDC shall be partitioned into discrete subsystems: an Operational subsystem, a Development subsystem, a Sustainment subsystem LAN (which allows development and testing to continue simultaneously with system operation), a Training subsystem, and an alternate operational subsystem.	I			D
N3.1.d	The US NDC shall provide the capability to undergo a full development and operational test and evaluation on the Development subsystem with no impact to ongoing operations.				D
N3.1.e	The US NDC Development subsystem shall be fully functionally redundant with the Operational subsystem, with no shared components between subsystems except for data feeds and archives.	I			D
N3.2.a	The US NDC shall automatically execute data acquisition, data processing, and data storage functions.				D
N3.2.b	The US NDC shall provide manual execution capability for all automated data acquisition, data processing, and data storage functions.				D
N3.3.a	The US NDC shall use standard data input formats for waveform data.				D
N3.3.b	The US NDC shall have forward and backward compatibility with the standard waveform data.				D
N3.4.a	The US NDC shall provide the capability to acquire authenticated data.				D
[redacted]					
N3.6.a	The US NDC shall automatically acquire unprocessed seismic, hydroacoustic, infrasonic, and radionuclide sensor data.				D

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N3.7.a	The US NDC shall automatically store all data processing results and associated data as soon as they are available.				D
N3.7.b	The US NDC shall provide access to all data processing results, which have been committed to data, storage.				D
N3.7.c	The US NDC shall automatically process all data from stations listed in the US NDC NDDOC.				D
N3.8.a	The US NDC shall provide an interactive analysis capability to review, refine, correct, and/or display current results, regardless of whether they have been generated directly from the automated processing system or have been previously analyzed.				D
N3.9.a	The US NDC shall provide the capability to automatically generate reports for all events.	I			D
[redacted]					
N3.11.a	The US NDC shall provide the capability to automatically and interactively monitor data processing functions.				D
N3.11.b	The US NDC shall provide the capability to automatically and manually generate performance monitoring reports.				D
[redacted]					

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N3.12.b	The US NDC shall integrate software tools and functions, to be provided as GFE, which automatically and interactively access, spatially manipulate, and spatially process geographically referenced data.	I			D	
N3.13.a	The US NDC shall provide software tools to support tuning and evolution of geophysical performance.	I			I	
N4.1.a	The expected service life of all US NDC operational platform hardware components shall be five years from the conclusion of Phase 2 System Acceptance Testing.	I	A			
N4.2.a	The US NDC shall support a mission duration of 24 hours per day, 7 days per week, 365 days per year.		A			

N4.3.a	[redacted]
	• Mean Restoration Time (MRT) – the time to restore the subsystem to an operational condition after a critical failure and includes notification, response, supply, administration, and maintenance.
	• Mean Time Between Critical Failures (MTBCF) – the time between critical failures. A critical failure implies that a portion of the US NDC hardware and/or software is unable to collect or process required data. Any of the following conditions constitutes a US NDC critical system failure:
	  • The inability of the US NDC to continuously process data from any sensor station identified as essential to monitoring within one hour of data acquisition at the station.
	  • The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 98% data accuracy and within 15 minutes of data acquisition at the station.
	  • The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 97% data timeliness and within five minutes of data acquisition at the station.
	  • The inability of the US NDC spotlight and forward processing pipelines to identify and report an explosion within one hour of data acquisition at the station.
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N4.3.d	No repair action mitigating a US NDC critical failure shall exceed four hours.		A		
N4.3.e	The US NDC shall be designed to ensure 95% of repairs are made in less than two hours.		A		
N4.4.a	The US NDC shall be designed for a two-level maintenance concept.	I			
N4.4.b	The US NDC shall exhibit a minimum time between preventative maintenance routines (PMRs) of 720 hours.		A		
N4.4.c	No US NDC PMR shall require a system outage such that a critical failure situation (as defined in requirement N4.3.a) occurs.		A		
N4.5.a	All US NDC critical failures (as defined in paragraph N4.3.a) shall be automatically detected and reported.				D
N4.5.b	All detected faults shall be isolated to one LRU using a combination of automatic fault isolation and manual troubleshooting procedures contained in the system technical documentation.		A		D
N4.5.c	The US NDC shall detect and report the loss of a storage device.				D
N4.5.d	The US NDC shall automatically switch to an alternate storage device to allow for continued system operations in the event of a storage device failure.				D
N4.5.e	The US NDC shall provide a graphical display of US NDC system status by monitoring and reporting the health of US NDC critical hardware and software components in a real-time environment.				D
N4.5.f	The US NDC shall allow for data recovery in the event of storage device failure.				D
N4.6.a	The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour without loss of data or system integrity.				D
N4.7.a	The US NDC shall provide the capability to automatically monitor, collect, and report fault information.				D
N4.8.a	The US NDC shall maximize the use of interchangeable workstations, LRUs, and circuit card assemblies (CCAs).	I			
N4.9.a	The US NDC shall operate at a noise level in accordance with the Occupational Safety and Health Administration (OSHA) guidelines for an office environment.				D
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[redacted]					
N5.2.a	The US NDC architecture shall comply with all security standards levied down by appropriate DAA.	I			
N6.1.a	The US NDC system shall be capable of operating in a normal office environment with local power, 110-120/220-240 volts AC, 60 Hz, single phase, and shall be robust enough to handle voltage irregularities and power loss without damaging the system and/or losing stored data.				D
N6.1.b	The US NDC shall be capable of sustained operation over the temperature range of 60-90° F.		A		
N6.1.c	The US NDC shall be capable of sustained operation over the relative humidity range of 20-80%.		A		
N6.1.1.a	The US NDC shall have the capability to perform an orderly shutdown when notified of an imminent power loss and/or if the operating temperature exceeds 90° F.				D
N6.2.a	The computer hardware elements of the US NDC system shall meet commercial standards and shall not fail due to electrostatic discharges produced by proper handling, operation, and maintenance of the system.	I			
N6.3.a	The US NDC computer hardware shall comply with Part 15 of Federal Communications Commission (FCC) rules for Class A digital devices.	I			
N6.4.a	The US NDC shall comply with the requirements of applicable regulations promulgated by federal regulatory agencies governing toxic products and hazardous materials.	I			
N6.5.a	The US NDC shall not include, or require the use of, volatile organic compounds restricted by regional air quality regulations.	I			
N6.6.a	The US NDC shall be designed to support introduction of upgraded software/hardware, functionality, and additional processing capacity without unplanned loss of previous capabilities.	I			
N7.0.a	The US NDC software shall be written in high order programming languages, minimizing the number of languages.	I			
N7.0.b	The US NDC shall make maximum use of commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) software.	I			

N8.0.a	The US NDC software shall have a uniform and consistent user interface for access to all the processing capability within the US NDC.	I			
N9.0.a	The US NDC Training Subsystem shall reliably simulate US NDC operations, and support the school's effort to provide personnel capable of performing to AFTAC standards in this critical environment.	I	A	T	D
[redacted]					
N10.0.b	The Alt US NDC shall ensure continuous 24-hour operations during times of evacuation of AFTAC during natural disasters.	I	A	T	D

AF b(

Appendix C: US NDC Phase 2 Build 1 Requirements

US NDC Phase 2 Build 1 Requirements

The following are the top-level requirements for US NDC Phase 2 build 1 in priority order. Requirements R1.1 to R1.7 are of equal importance and must be in build 1. Requirements R1.8 and R1.9 are desired capabilities for build 1 listed in order of priority. As part of the build 1 plan, the contractor shall develop a system specification that provides the associated detailed requirements.

R1.1 Modernize the DACS architecture

Intent: The current Distributed Acquisition Control Software (DACS), a product called "ISIS," is no longer a supported COTS product. The contractor shall survey industry and determine the best DACS product to use. A leading candidate for this application is Tuxedo which is part of the International Data Center (IDC) release 3 software that will be used as part of the baseline for this build.

R1.2 Integrate infrastructure to support regional magnitude capability

Intent: Significant enhancements have been made to the amplitude and magnitude database tables in the IDC release 3 software baseline. The requirements for these tables originally came from AFTAC. These enhancements are essential for proper handling of regional magnitudes.

R1.3 Upgrade the operating system

Intent: Since build 1 is primarily an infrastructure upgrade, a significant amount of regression testing will be needed. This makes it an appropriate time to also upgrade the operating system. The contractor shall upgrade the system to the most recent version of Solaris. An upgrade of the operating system is needed if we upgrade to the latest version of Oracle (see R1.4).

R1.4 Upgrade the database version

Intent: Since build 1 is primarily an infrastructure upgrade, a significant amount of regression testing will be needed. This makes it an appropriate time to also modernize the Oracle database version. The contractor shall upgrade the system to the most recent version of Oracle. There are additional benefits with this database upgrade related to knowledge base products from Sandia.

R1.5 Upgrade the training system (TS)

Intent: Any changes that are made to the US NDC headquarters (HQ) system that are relevant to the TS should also be made to the TS. The intent is to keep HQ and TS synchronized.

R1.6 Integrate new software baseline, new database schema, new government furnished equipment (GFE)

[redacted]

AF b(2)
AF b(3)

R1.7 Meet the requirements of the current operational system

Intent: The operational US NDC and training system shall continue to meet all current capabilities after incorporation of build 1.

R1.8 Upgrade the low-to-high and high-to-low data transfer mechanisms

[redacted]

AF b(2)
AF b(3)

R1.9 Expand the US NDC B-side LAN to emulate operations

Intent: The contractor shall expand the US NDC B-side LAN. The short-term goal (build 1) is to have a B-Side LAN that fully replicates the operational LAN; thus allowing full dual operations prior to switchover. The longer term goal (during a future build) is a sustainment LAN which is sufficiently robust to allow sustainment work, a test pipeline, configuration management, and promotion to operations to continue while the B-Side LAN is in a frozen configuration.